**Before the**
**Federal Communications Commission**
**Washington, DC 20554**

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| In the Matter of | ) | |
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| Use of Spectrum Bands Above 24 GHz For Mobile Radio Services | ) | GN Docket No. 14-177 |
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| Establishing a More Flexible Framework to Facilitate Satellite Operations in the 27.5-28.35 GHz and 37.5-40 GHz Bands | ) | IB Docket No. 15-256 |
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| Petition for Rulemaking of the Fixed Wireless Communications Coalition to Create Service Rules for the 42-43.5 GHz Band | ) | RM-11664 |
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| | ) | |
| Amendment of Parts 1, 22, 24, 27, 74, 80, 90, 95, and 101 To Establish Uniform License Renewal, Discontinuance of Operation, and Geographic Partitioning and Spectrum Disaggregation Rules and Policies for Certain Wireless Radio Services | ) | WT Docket No. 10-112 |
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| Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz and 48.2-50.2 GHz Frequency Bands; Allocation of Spectrum to Upgrade Fixed and Mobile Allocations in the 40.5-42.5 GHz Frequency Band; Allocation of Spectrum in the 46.9-47.0 GHz Frequency Band for Wireless Services; and Allocation of Spectrum in the 37.0-38.0 GHz and 40.0-40.5 GHz for Government Operations | ) | IB Docket No. 97-95 |
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**Opposition to Petitions for Reconsideration**


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**Summary**

One of the critical themes that runs through the petitions for reconsideration filed by incumbent LMDS operators in this proceeding is the economic and technical difficulty they will face if forced to deploy UMFUS in rural areas. The Commission should reject calls of these petitioners to reduce or eliminate performance requirements in rural areas and instead should look for ways to encourage use by operators that are ready and willing to use the spectrum – fixed-satellite service ("FSS") operators. To ensure all of the millimeter wave spectrum identified in the *Spectrum Frontiers R&O* is used effectively and efficiently, the Commission should take steps affirmatively to promote FSS earth station siting in rural areas, especially in rural areas in which the incumbent licensee fails to meet performance requirements. This can be accomplished by relaxing the recently adopted earth station siting restrictions, including the 0.1 percent population coverage limit, and eliminating the prohibition against siting near transient populations and the limit of three earth stations per license area. It can also be accomplished by implementing a first-come, first-served licensing approach in geographic areas that are unlicensed or returned for failure to meet buildout requirements.

In addition, the Commission should authorize FSS in the 42 GHz band, adopt power limits and beamforming recommendations for terrestrial operations and eliminate the use of omni-directional antennas in shared bands as proposed by Boeing, and reject Nextlink's request that the Commission authorize UMFUS in the LMDS A2 band.

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**Opposition to Petitions for Reconsideration**

SES Americom, Inc. ("SES") and O3b Limited ("O3b") hereby submit their opposition to various petitions for reconsideration of the *Spectrum Frontiers R&O*,[1] which adopted rules for use of certain frequency bands above 24 GHz for mobile services by the newly-

[1] *See Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et al.*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 8014 (2016) ("*Spectrum Frontiers R&O*").

created Upper Microwave Flexible Use Service ("UMFUS").

Throughout the Spectrum Frontiers proceeding, the satellite industry has pointed out that terrestrial operators seeking to offer Fifth Generation ("5G") mobile service are unlikely to deploy service in rural areas[2] using frequencies above 24 GHz, and specifically the 27.5-28.35 GHz ("28 GHz"), 37.0-38.6 GHz ("37 GHz") and 38.6-40.0 GHz ("39 GHz") bands. Many of the petitions for reconsideration filed in this proceeding reinforce exactly what the satellite industry has maintained from the beginning. Not only do the petitioners confirm that it is not economically or technically viable for them to deploy UMFUS service in rural areas, they effectively ask the Commission to prohibit any other operators to deploy by requesting that buildout requirements in rural areas be relaxed or eliminated altogether. The Commission can ensure all Americans benefit from the valuable spectrum available in rural areas by revising its earth station siting rules to permit fixed-satellite service ("FSS") earth stations to use the 28 GHz band to provide broadband data service across the United States and around the world.

SES and O3b agree with several proposals made by other satellite companies in their petitions for reconsideration. Specifically, the Commission should encourage satellite industry growth by creating an FSS allocation in the 42.0-42.5 GHz ("42 GHz") band. The Commission should also protect satellite operations by implementing UMFUS technical requirements recommended by The Boeing Company ("Boeing"), including beamforming and power limits.

[2] *See, e.g.*, Petition for Reconsideration of Competitive Carriers Association, GN Docket No. 14-177, *et al.*, at 9-11 (filed Dec. 14, 2016) ("CCA Petition"); Petition for Reconsideration of The Rural LMDS Licensees, GN Docket No. 14-177, *et al.*, at 4, 7 (filed Dec. 14, 2016) ("Rural LMDS Licensees Petition").

## I. The Commission Should Grant Satellite Operators' Requests for Flexibility to Ensure Available Spectrum is Fully Utilized

The petitions for reconsideration submitted by several rural Local Multipoint Distribution Service ("LMDS") operators demonstrate a real risk that the 28 GHz band spectrum will go unused in a substantial portion of the United States unless the Commission revises its rules to allow FSS networks the flexibility to locate earth stations in areas terrestrial operators have no intention of occupying. Accordingly, the Commission should reject the LMDS operators' requests and adopt an alternative to the overly restrictive earth station siting requirements in Section 25.136.

### A. Terrestrial Stakeholders Confirm They Do Not Intend to Deploy UMFUS Services in Rural Areas

In their petitions for reconsideration, the Competitive Carriers Association ("CCA") and the Rural LMDS Licensees acknowledge that terrestrial licensees in rural areas will be unable to meet their license performance requirements, in part because there are virtually no economically or technologically viable millimeter wave band 5G applications for use in rural areas.[3] Unless the Commission modifies its rules to allow FSS earth stations greater access to millimeter wave frequencies as urged in petitions for reconsideration filed by satellite operators,[4] the spectrum will simply remain unused in a very large portion of the U.S. territory, wasting a resource that is critical to FSS growth and for which existing 28 GHz systems have no substitute.

[3] *See* CCA Petition at 9-10; Rural LMDS Licensees Petition at 4.

[4] *See, e.g.*, Joint Petition for Reconsideration of EchoStar Satellite Operating Corporation, Hughes Networks Systems, LLC, and Inmarsat, Inc., GN Docket 14-177, *et al.,* (filed Dec. 14, 2016) ("EchoStar/Inmarsat Petition"); *see also* Petition for Reconsideration of SES Americom, Inc. and O3b Limited, GN Docket 14-177, *et al.*, at 4-14 (filed Dec. 14, 2016) ("SES/O3b Petition"); Petition for Reconsideration of The Satellite Industry Association, GN Docket No. 14-177, *et al.* (filed Dec. 14, 2016); Petition for Reconsideration of The Boeing Company, GN Docket 14-177, *et al.* (filed Dec. 14, 2016) ("Boeing Petition").

CCA and the Rural LMDS Licensees object to the Commission's decision to divide the LMDS 28 GHz BTA licenses into county licenses as part of the upgrade from LMDS to UMFUS and request that their licenses be based on the original BTAs.[5] SES and O3b oppose this request. The petitioners argue that maintaining separate licenses will increase administrative burdens and that the division will require licensees to "deploy needless infrastructure"[6] and serve areas where providing 28 GHz service may not be economically feasible.[7] They also contend that it would be unfair for incumbent BTA licensees who have met existing buildout requirements to forfeit rights in rural counties that are not viable for terrestrial 28 GHz service because those counties may become populous in time.[8]

The Commission considered and rejected those same arguments in choosing to subdivide the existing 28 GHz licenses into more appropriate county-area licenses.[9] In deciding to issue county-based licenses to incumbent LMDS licensees, the Commission held that county licenses best fit the type of localized services and targeted deployments expected in the UMFUS bands, which do not propagate well over long distances (or even moderate distances).[10] The Commission emphasized that if "existing BTA licensees do not believe it is economically viable to build within certain counties of a BTA, we believe it would be appropriate to give other interested parties an opportunity to license and to make use of the spectrum."[11] Earth station operators represent one set of stakeholders particularly interested in making use of spectrum that

[5] *See* CCA Petition at 9-11; Rural LMDS Licensees Petition at 4-6.
[6] CCA Petition at 9.
[7] *See* Rural LMDS Licensees Petition at 5.
[8] *See id.* at 5-6; CCA Petition at 10.
[9] *See Spectrum Frontiers R&O* ¶ 35.
[10] *See id.* In fact, the Commission considered the possibility of even smaller license areas, census tracts, for the same reason.
[11] *Id.* The Commission also noted that dividing BTA licenses is fair to incumbents, who are "obtaining valuable new rights [while] keeping the same bundle of rights they had previously."

CCA and the Rural LMDS Licensees do not plan to use, and satellite companies have proposed approaches that would encourage earth stations to locate in underused locations.[12] If CCA and the Rural LMDS Licensees are granted their request, the Commission will effectively be sanctioning spectrum warehousing – allowing rural LMDS operators to continue to hold spectrum that they have no intention of using.

B. The Commission Can Promote Robust Use of UMFUS Spectrum by Increasing FSS Earth Station Access, Particularly in Rural Areas

Since it is clear that terrestrial operators do not have plans to build out operations in the 28 GHz band or the 37/39 GHz bands in rural areas, the Commission must revise its earth station siting rules to ensure that the UMFUS spectrum does not lie fallow. SES and O3b understand that the overarching intent of the Commission's siting restriction is to facilitate the deployment of UMFUS. However, as described in the SES/O3b Petition and by other satellite operators, the siting restrictions make it almost impossible for FSS operators to identify appropriate earth station locations that meet all of the restrictions set out in Section 25.136.[13] Indeed, a number of satellite operators have pointed out the paradox that the earth station siting restrictions in some cases make siting in rural areas even *more* difficult.[14]

Furthermore, the rules are completely unworkable for NGSO earth stations, which require greater flexibility because their interference zones vary as their earth stations track satellites orbiting the earth. In essentially acknowledging that the Commission's highly restrictive siting rules do not account for the needs of NGSO systems like O3b's, the Commission suggests that O3b has the option of siting in relatively remote areas.[15] But

[12] *See* SES/O3b Petition at 10-13; EchoStar/Inmarsat Petition at 15-20; Boeing Petition at 25.
[13] *See* SES/O3b Petition at 4-15; EchoStar/Inmarsat Petition at 9-21; Boeing Petition at 23-25.
[14] *See* SES/O3b Petition at 5-9; EchoStar/Inmarsat Petition at 9-11; Boeing Petition at 23-25.
[15] *See Spectrum Frontiers R&O* ¶ 46.

paradoxically, the siting restrictions all but ensure that O3b's earth stations *cannot* be located in rural areas. The siting restrictions, which impose unjustified limitations and create counterproductive incentives that drive earth stations *away* from siting in rural areas, are completely unworkable for NGSO earth stations, which require greater flexibility because their interference zones vary as their earth stations track satellites as they orbit the earth.

To remedy this defect, the Commission must revisit its arbitrary population coverage threshold and remove the transient population restrictions and "three earth stations per license area" rule in order to create a more pragmatic regime that grants FSS operators increased flexibility for siting earth stations in rural areas. EchoStar and Inmarsat point out the flawed reasoning behind the 0.1 percent population limit established in Section 25.136, noting that the Commission's reasoning was based on an incorrect interpretation of population distribution.[16] EchoStar and Inmarsat explain that even in spectrum without the limited propagation properties of UMFUS bands, such as 4G/LTE services provided in frequencies below 3 GHz, subscribers can now see an LTE signal only 81 percent of the time.[17] And 81 percent vastly overstates the extent of geographic LTE coverage, because the figure only reports the percentage of time an LTE signal is available to people where they are actually using their devices, and thus is a population-centric measure.[18] It makes no sense to restrict FSS operators to covering no more than 0.1 percent of the population of any county when the rules only require UMFUS to serve 40 percent of the population. When those figures are applied to typical real world cases the contrast is even more stark. O3b has shown that the 40 percent population coverage performance

[16] *See* EchoStar/Inmarsat Petition at 17-19.
[17] *See id*. at 16.
[18] *See Actual Mobile Experience*, OpenSignal, *https://opensignal.com/methodology/availability/* (last viewed Jan. 31, 2017). OpenSignal's geographic coverage maps show that actual LTE coverage is far less than 81 percent of the geographic area of the country. *See Coverage Maps*, OpenSignal, https://opensignal.com/network-coverage-maps/ (last viewed Jan. 31, 2017).

benchmark can be satisfied by one percent or less geographic coverage.[19] The lack of proportionality is even more apparent when UMFUS licensees state that the millimeter wave bands are essentially useless for terrestrial service in rural areas. Where there is no terrestrial service, FSS earth stations cause *no* interference. The 0.1 percent restriction is therefore arbitrary and antagonistic to the goal of productively using the spectrum in rural areas.[20]

SES and O3b have proposed a revised approach to Section 25.136 that protects UMFUS licensees' ability to deploy services in the 28 GHz band while simultaneously allowing earth station operators sufficient flexibility to site earth stations in less densely populated areas.[21] Specifically, SES and O3b have proposed a three-tiered system that encourages earth station operators to look for locations in less populated locations, away from areas that are realistic candidates for UMFUS deployment.[22] EchoStar and Inmarsat have also petitioned the Commission to modify or remove the earth station siting restrictions, arguing that the Commission should consider implementing the sharing proposal put forth by AT&T and EchoStar.[23] While the EchoStar/AT&T proposal includes power limits that are unworkable for NGSO systems such as O3b,[24] the overarching approach of encouraging earth stations to deploy

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[19] *See* Reply Comments of O3b, GN Docket No. 14-177, *et al.*, at 16-17 (filed Oct. 31, 2016) (showing that an UMFUS licensee need only cover 31 of Yakima County, Washington's 4,264 square miles, or less than one percent of the county, to perfect rights to exclude FSS from the entirety of the county in perpetuity).

[20] *Cf.* 47 U.S.C. § 309(j)(4)(b) (requiring the Commission to "ensure prompt delivery of service to rural areas [and to] to prevent stockpiling or warehousing of spectrum by licensees or permittees").

[21] *See* SES/O3b Petition at 10-13.

[22] *See id.* at 11-12. SES and O3b proposed to divide counties into three tiers based on population density and impose different earth station population metrics in each tier. *Id*.

[23] *See* EchoStar/Inmarsat Petition at 19.

[24] *See Ex Parte* Letter from Suzanne Malloy, Vice President, Regulatory Affairs, O3b, to Marlene Dortch, Secretary, FCC, GN Docket No. 14-177, *et al.*, at 6-7 (filed May 31, 2016). O3b expressed concerns about the AT&T/EchoStar proposal, noting that the "value of 12.2 dBm/MHz is specific to GSO FSS earth stations only. This value is too constraining on O3b's

outside of "urban cores" by providing reasonable flexibility parallels the proposal made by SES and O3b. The EchoStar/AT&T power limits were in fact developed without reference to considerations relevant to NGSO operations, an oversight in more urgent need of correction in light of NGSO systems' demonstrated interest in serving the United States using millimeter wave spectrum.[25] Therefore, if the Commission chooses to adopt the EchoStar/AT&T proposal, it must be revised to accommodate NGSO operations.

Like SES and O3b, EchoStar and Inmarsat highlight just how unworkable the transient population limit is for FSS earth station siting due to the infrastructure needs of earth stations,[26] notably NGSO earth stations. Particularly compelling is the companies' showing that fiber is often installed along the transportation infrastructure near which the Commission has prohibited earth station siting.[27]

Further, EchoStar and Inmarsat note that the Commission's siting restrictions are too vague to provide meaningful guidance. The EchoStar/Inmarsat Petition notes that the meanings of eight terms within the transient population restrictions are open to interpretation,[28] and many more questions regarding the rule's language could be posed. In short, the Commission has failed to provide the necessary specificity to enable implementation of its transient population restrictions. If these limits are not repealed, every earth station application

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operations by approximately 30 dB." *Id.* In other words, if a fixed EIRP density toward the horizon were to be adopted, it would have to be 30 dB higher in order to sustain O3b's NGSO operations.

[25] EchoStar and Inmarsat acknowledge the multiple proposals for NGSO satellite systems in the Ka-band, when demonstrating the growing FSS interest in the Ka-band. *See* EchoStar/Inmarsat Petition at 4.

[26] *See id.* at 11-15. The transient population restrictions are even more unworkable for NGSO earth stations. *See also Spectrum Frontiers R&O* ¶ 46. The Commission recognized "that sharing may be more difficult for non-geostationary satellite systems, such as the system operated by O3b." *Id.*

[27] *See* EchoStar/Inmarsat Petition at 12-14.

[28] *See id.* at 14-15.

could become a burdensome exercise in exploring what the terms mean, consuming the resources of the Commission, FSS operators and UMFUS operators, and potentially delaying launch of innovative satellite systems that will clearly serve the U.S. public interest.

The critical importance of the ability to deploy FSS facilities in close proximity to transportation infrastructure should not be ignored. The transient population restrictions not only limit FSS operators' ability to deploy mission critical earth stations but also make it nearly impossible for companies to locate test facilities in the United States or to properly test U.S. manufactured Ka-band antennas.[29] This imposes unreasonable burdens on FSS operators without sufficient justification on the record.

C. If Performance Requirements for Incumbent Rural LMDS Operators Are Relaxed, FSS Earth Station Operators Should be Granted Wider Access to Those Licensed Areas

In addition to asking to assign 28 GHz licenses on a BTA basis to existing LMDS operators, Nextlink Wireless, LLC ("Nextlink"), CCA and the Rural LMDS Licensees also ask the Commission to greatly relax, or even eliminate, performance requirements for rural counties. Nextlink argues that population-based coverage requirements would cause many rural county licenses to lie fallow by chilling incentives to invest in them.[30] Nextlink asks the Commission essentially to exempt some counties from performance requirements or greatly extend the deployment deadlines,[31] while CCA proposes that incumbent LMDS licensees be exempt from

[29] For example, O3b's Network Operations Center requires access to fiber in order to manage the global O3b network and to test new antennas. Siting any similar facility in the U.S. is exponentially more complicated under the Commission's new earth station siting rules. These facilities must be near transportation hubs in order to attract skilled labor. Similarly, in order to receive, test and deploy new and innovative FSS earth station antennas, testing facilities must be easily accessible.

[30] *See* Petition for Reconsideration or, in the Alternative, Clarification of Nextlink Wireless, LLC, GN Docket No. 14-177, *et al.*, at 4 (filed Dec. 14, 2016) ("Nextlink Petition").

[31] *See id.* at 10; CCA Petition at 11.

UMFUS performance requirements altogether.[32] In the alternative, CCA proposes to allow incumbents to maintain rights to all counties in a BTA by meeting the performance requirements in one county only.[33]

The petitioners justify relief or exemption from performance requirements by arguing that providing 28 GHz service in rural counties would be impossible, impractical or uneconomic. Nextlink contends that the Commission may not even be able to give away 28 GHz licenses in many rural counties if burdened by performance requirements because the business case for rural 5G service is so tenuous.[34] The Rural LMDS Licensees and CCA contend that building 5G in rural counties would be a "needless cost" and that they are "unaware of any technologies that will accommodate mobile service in the 28 GHz band in rural areas."[35] Yet these petitioners ask to be allowed to hold exclusive rights to use (or not to use) the spectrum in these vast areas in perpetuity, without obligation, in case a business opportunity arises at some time in the future.

The Commission should not – and by law cannot – simply allow any UMFUS licensee indefinitely to exclude others from using the 28 GHz spectrum without ever providing service. The Communications Act requires the Commission to include performance requirements to prevent the warehousing or stockpiling of spectrum and to "ensure prompt delivery of service to rural areas."[36] The rural petitioners ask the Commission to contravene the

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[32] *See* CCA Petition at 11.
[33] *See id.* The Rural LMDS licensees make the same proposal. *See* Rural LMDS Licensees Petition at 7-8.
[34] *See* Nextlink Petition at 4-5.
[35] Rural LMDS Licensees Petition at 6; CCA Petition at 10-11.
[36] *See* 47 U.S.C. § 309(j)(4)(b). The Commission has held that performance requirements are prerequisite to renewal expectancy. *See Amendment of the Commission's Rules Regarding the 37.0-38.6 GHz and 38.6-40.0 GHz Bands*, 12 FCC Rcd 18600 ¶ 49 (1997). In the same order, the Commission found that "extending the build-out deadline past renewal . . . would not be

Act and adopt rules that would do exactly the opposite: allow rural UMFUS licensees to hold their licenses indefinitely in hopes that a business case may eventually emerge.

SES and O3b agree with the rural petitioners that the economics simply do not support deployment of 28 GHz UMFUS services in rural areas.[37] But there *is* a solid and proven business case for allowing use of the same spectrum in rural areas for the provision of FSS service, and doing so will not impede future UMFUS service.

The Commission should encourage earth station deployment in rural areas that are not purchased at auction or where UMFUS licensees cannot meet their buildout requirements. Such deployments can be incentivized by adopting distinct earth station siting rules for unlicensed areas or areas where licensees fail to meet their buildout requirements. SES and O3b have previously argued that, given the propagation characteristics of the 28 GHz band and other millimeter wave bands, issuing site-specific licenses on a first-come, first-served site basis in unlicensed areas makes more sense than auctioning large, exclusive UMFUS-only licenses.[38] If a rural UMFUS licensee fails to meet its buildout requirements in a county, that county should become available to any willing provider of FSS or UMFUS service on a first-come, first-served basis.[39]

An alternative means to achieve this goal would be to allow rural UMFUS licensees to meet some or all of their performance requirements by encouraging and permitting FSS sites in those counties. This approach would ensure that spectrum is put to use, rather than

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prudent nor would it appear to be consistent with the objectives of Section 309(j) of the Communications Act." *Id*. ¶ at 48.

[37] Terrestrial operations will face similar economic and geographic impediments to providing service in rural areas in other millimeter bands, such as the 37/39 GHz band.

[38] *See* Comments of O3b Limited, GN Docket No. 14-177, *et al.*, at 20-25 (filed Jan. 28, 2016); Comments of O3b Limited, GN Docket No. 14-177, *et al.*, at 10-11 (filed Sept. 30, 2016); SES/O3b Petition at 14.

[39] *See* SES/O3b Petition at 14.

being warehoused. It also has the advantage of allowing the parties to identify protected earth station locations that meet the FSS operator's requirements while also being consistent with likely future UMFUS deployment. If UMFUS deployments in rural areas ever emerge, they will be limited in scope and coverage. In rural areas, there is no need for the Commission to restrict either FSS or UMFUS in order to make room for both services.

Should the Commission choose to relax performance requirements that apply to rural UMFUS licenses, it should, at minimum, substantially loosen the earth station siting restrictions applicable to those same license areas. Doing so would be consistent with the Commission's goals in establishing performance requirements to "promote the productive use of spectrum, to encourage licensees to provide service to customers in a timely manner, and to promote the provision of innovative services in unserved areas, particularly rural ones."[40]

The record is replete with suggestions on how the Commission can best relax earth station siting restrictions, but those proposals have some common principles the Commission should incorporate into any revised rule for earth station siting. These include establishing reasonable population-based metrics for identifying earth station sites and eliminating unnecessary additional siting restrictions, such as transient population restrictions and limits on the number of available sites. The Commission should not allow UMFUS licensees to keep BTA license areas expressly for the purpose of warehousing spectrum in areas uneconomic for 5G and must not extend buildout periods where even existing licensees admit there is no likelihood of meeting coverage requirements. The inability of a geographic area to provide an economic case for the use of spectrum by one service should not be used as a reason to preclude the use of spectrum by another service that is ready, willing and able to use it.

[40] *Spectrum Frontiers R&O* ¶ 191.

## II. The Record Supports Establishing an Allocation and Service Rules for FSS in the 42 GHz Band

SES and O3b agree with ViaSat, Inc. ("ViaSat")[41] and Boeing[42] that the Commission erred in declining to adopt an FSS space-to-earth allocation in the 42 GHz band. The record clearly demonstrates strong satellite industry interest in the 42 GHz band in contrast to terrestrial operators, who expressed at best lukewarm interest. As ViaSat noted, satellite companies showed much more enthusiasm for and commercial interest in the use of the 42 GHz band than did terrestrial proponents.[43] Both Boeing and SIA noted that satellite entities have pending proposals to deploy facilities in this band.[44] In contrast, terrestrial proponents expressed more limited interest in investing in this spectrum,[45] and did not provide any specific proposals to protect the radio astronomy services ("RAS") in the adjacent band.

The public interest is best served by an FSS allocation in the 42 GHz band. The Commission has restricted FSS access to the 37/39 GHz band in order to facilitate UMFUS deployment. By allocating the 42 GHz band for FSS, the Commission would at least partially offset the additional limitations placed on earth station siting for FSS V-band downlink spectrum. An allocation in the 42 GHz band would enable FSS operators to expand to meet growing requirements for broadband capacity in the United States and help facilitate a private-

[41] *See* Petition for Partial Reconsideration of ViaSat, Inc., GN Docket 14-177, *et al.*, at 3-7 (filed Dec. 14, 2016) ("ViaSat Petition").
[42] *See* Boeing Petition at 21-22.
[43] *See* ViaSat Petition at 7-9.
[44] *See, e.g.*, Reply Comments of the Satellite Industry Association, GN Docket 14-177, *et al.*, at 14-15 (filed Feb. 26, 2016); Comments of The Boeing Company, GN Docket 14-177, *et al.*, at 9 (filed Jan. 28, 2016); Reply Comments of The Boeing Company, GN Docket 14-177, *et al.*, at 19 (filed Feb. 26, 2016).
[45] *See* ViaSat Petition at 5 ("[T-Mobile] was the only commenter to suggest that certain terrestrial uses in this band segment might be feasible.").

sector solution to meet Chairman Pai's goal of bridging the digital divide in rural America.[46] Furthermore, the Commission has already acknowledged that FSS is better able to protect the existing RAS in the 42.5-43.5 GHz band than terrestrial operators.[47]

## III. The Commission Should Adopt Boeing's Technical Recommendations for Terrestrial Operations in Shared Bands

SES and O3b support several of the technical recommendations Boeing made in its petition for reconsideration.[48] Specifically, the Commission should impose an EIRP limit of 62 dBm on UMFUS base stations in the 28 GHz and 37/39 GHz bands, and the Commission should adopt Boeing's proposed beamforming and power control requirements.

Boeing correctly observes that the record does not support the 75 dBm power limit adopted by the Commission. Instead, Boeing demonstrates that the limit should be set at 62 dBm, a level that was originally proposed by the Commission and which satisfies the actual operational needs of UMFUS operators.[49] Not only is the higher power limit unwarranted, it could have a significant effect on NGSO systems generally and O3b's system specifically. O3b, the only operating millimeter wave band NGSO FSS broadband system, is a low elevation angle NGSO system with an interest in expanding into the 37/39 GHz band. As a result of its low

[46] *See* Remarks of Ajit Pai, Chairman, FCC, at 2 (Jan. 24, 2017), http://transition.fcc.gov/Daily_Releases/Daily_Business/2017/db0124/DOC-343184A1.pdf.
[47] *See Allocation and Designation of Spectrum for Fixed-Satellite Services in the 37.5-38.5 GHz, 40.5-41.5 GHz, and 48.2-50.2 GHz Frequency Bands; Allocation of Spectrum to Upgrade Fixed and Mobile Allocations in the 40.5-42.5 GHz Frequency Band; Allocation of Spectrum in the 46.9-47.0 GHz Frequency Band for Wireless Services; and Allocation of Spectrum in the 37.0-38.0 GHz and 40.0-40.5 GHz for Government Operations*, Third Notice of Proposed Rulemaking, 25 FCC Rcd 15663 ¶ 18 (2010).
[48] *See* Boeing Petition at 5-6.
[49] *See id*. at 7-10.

elevation angle, the arbitrary increase in terrestrial power limits could substantially constrain O3b's ability to site earth stations in the band.[50]

Additionally, SES and O3b support Boeing's proposal for the addition of a beamforming and power control requirement for UMFUS transmitters. SES argued throughout the rulemaking process that the Commission must take one of two approaches to limit the impact of UMFUS emissions on co-frequency satellite receivers in FSS uplink bands: (1) limit aggregate skyward emissions[51] or (2) codify the specific techniques that UMFUS operators claim will prevent harmful interference.[52] Boeing demonstrates that the UMFUS operators and the Commission rely heavily on the assumption that certain terrestrial transmitter design measures will ensure that interference to space stations does not reach disruptive levels. The only way such protection can be assured is if the techniques are codified.[53] SES and O3b also support Boeing's proposal to adopt the 3GPP models to establish off-axis beamforming requirements.[54] These models would ensure better protection for potential interference victims and would result in little additional burden on UMFUS equipment manufacturers and operators.

SES and O3b further agree with Boeing that the Commission must revise its rules to ensure UMFUS licensees employ directional antennas by removing the exception set out in Section 30.406(a) that would allow the use of the omni-directional antennas where a station

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[50] O3b's low look angle increases the likelihood that terrestrial transmissions could cause interference to its future passive earth station receive operations in the 37/39 GHz band.
[51] *See* SES/O3b Petition at 19-24. SES and O3b have repeatedly raised concerns about the potential for harmful aggregate interference to the satellite receivers from terrestrial base stations and other transmitters in the 28 GHz band.
[52] *See Ex Parte* Letter from Petra A. Vorwig, Senior Legal & Regulatory Counsel, SES Americom, Inc., to Marlene H. Dortch, Secretary, FCC, GN Docket No. 14-177, Attachment at 7 (filed June 16, 2016).
[53] *See* Boeing Petition at 10-17.
[54] *See id*. at 13.

communicates with more than one point.[55] Permitting omni-directional antennas is contrary to the record, which exclusively contemplates directional antennas. Omni-directional antennas threaten to undermine the ability to share the 28 GHz and 37/39 GHz bands, a primary goal of the Commission's proceeding.

## IV. The Commission Should Reject Requests to Make the LMDS A2 Block Available for UMFUS

The Commission should reject the petition of Nextlink to allocate the LMDS A2 band (29.10-29.25 GHz) for UMFUS use.[56] There is no evidence in the record to suggest that this 150 MHz slice of spectrum would be well suited to UMFUS operations. To the contrary, several terrestrial commenters have noted that a basic allocation suitable for 5G terrestrial service requires a minimum of 200 MHz of contiguous spectrum.[57] The LMDS A2 band does not provide that. Consequently, SES and O3b urge the Commission not to convert the LMDS A2 band for UMFUS use.[58]

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[55] *See id*. at 20-21 (citing 47 C.F.R. § 30.406(a)).

[56] *See* Nextlink Petition at 3-17; Comments of Verizon, GN Docket No. 14-177, *et al.*, at 4-5 (filed Sept. 30, 2016). In addition to LMDS, the 29.1-29.25 GHz band is allocated to NGSO operations in the Mobile-Satellite Service.

[57] *See* Comments of Straight Path Comments, GN Docket No. 14-177, *et al.*, at 3-5 (filed Sept. 30, 2016) ("Straight Path Comments"); *see also* Comments of AT&T, GN Docket No. 14-177, *et al.*, at 10 (filed Sept. 30, 2016); Comments of Samsung Electronics America, Inc. and Samsung Research America, GN Docket No. 14-177, *et al.*, at 14 (filed Sept. 30, 2016); *Spectrum Frontiers R&O* ¶ 94. Several commenters reference minimum bandwidth requirements of several hundred MHz or up to 1 GHz of contiguous spectrum. *See* Comments of Telecommunications Industry Association, GN Docket No. 14-177, *et al.*, at 3 (stating that "[a]ggregation of spectrum from several hundred MHz to even 1 GHz may be essential to promote next generation wireless networks"); *see also* Comments of NYU Wireless, GN Docket No. 14-177, *et al.*, at 56 (filed Jan. 13, 2015); Comments of Qualcomm, GN Docket No. 14-177, *et al.*, at 12 (filed Jan. 15, 2015); Comments of Nokia, GN Docket No. 14-177, *et al.*, at 27 (filed Jan. 15, 2015); Comments of Huawei, GN Docket No. 14-177, *et al.*, at 13-14 (filed Jan. 15, 2015).

[58] *See also* Straight Path Comments at 3-5.

## V. Conclusion

For the reasons explained in this opposition, the Commission should relax earth station siting restrictions, particularly in rural areas, to ensure the 28 GHz and 37/39 GHz spectrum does not go to waste. The Commission should reject calls to reduce or eliminate performance requirements in rural areas. Instead, it should take steps affirmatively to promote FSS earth station siting in rural areas, especially if the incumbent licensee fails to meet performance requirements.

In addition, the Commission should authorize FSS in the 42 GHz band, adopt the technical recommendations for terrestrial operations in shared bands described in the Boeing Petition, and reject Nextlink's request that the Commission authorize UMFUS in the LMDS A2 band.

Respectfully submitted,

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